

THE ANALYSIS OF STUDENT'S ERROR IN COMPLETING THE MATERIAL OF ALGEBRA CLASS VIII

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ABSTRACT

One indicator of the success of mathematics learning can be seen from the test results of the students. The test results not only to assess the students but through the test results can be known the difficulties faced by students and also the errors that many students do. Furthermore, the error is analyzed in-depth and then determined the appropriate action to be able to reduce the same error. The purpose of this study is to know and describe what kind of mistakes students make and find out the most mistakes that are often made. This research is qualitative descriptive research. The subject of his research is the students of class VIII SMP Negeri 1 Yogyakarta. The research object is the student's mistake in doing questions test on the Linear Equation System of Two Variables. This research's main instruments are the researcher itself, and the aid instrument is five questions test and interview guides. The technique of analysis used is the triangulation technique. The results of this research indicate that students make mistakes that are: 1. the error of concept, that is error determine a mathematical model and how to write an example of the problem; 2. the errors of principle, that is an error in understanding Linear Equation System of Two Variables settlement method; 3. the operation of the error, that is errors due to incorrect calculations.

Keywords: Analysis, Error, Linear Equation System of Two Variables

INTRODUCTION

Knowledge of mathematics and its application is essential to everyday life. We can not be denied that the development of science and technology is not regardless of the mathematical role in it. Considering the use of mathematics in all areas, strong mathematical mastery is required. Also, to master and create technology and survive in an increasingly advanced era, the mastery of mathematics must be well optimized. One way to optimize this is by improving the quality of mathematics learning for students.

Center for development and empowerment of educators and Education mathematics mentions that one of the purposes of learning mathematics is to develop problem-solving skills. So it is not a strange thing anymore if used to solve various problems facing humans in the daily life of mathematics. Therefore, mathematics is a subject that must be studied in the world of education from early to adulthood. Through mathematics learning, students are expected to foster critical, logical, systematic, thorough, effective, and practical thinking skills in solving problems.

At the 2013 curriculum syllabus, the first subject matter given to grade VIII students is algebraic operation: a two-variable linear equation. The subject matter of algebraic contains several basic competencies, one of which is to create and resolve mathematical models of real problems relating to the linear equations of two variables. Understanding the material needs to be implanted solidly because understanding the concept and skill of conducting operations will affect the understanding of the concepts and other operation skills. Thus, the more robust understanding of students regarding the concepts and procedures of problem-solving in mathematics is expected to support and optimize the objectives of learning to be achieved.

Understanding the math needs to be implanted solidly because understanding the concepts and skills of performing one's operations affects understanding the concepts and skills of other operations. Thus, the more robust understanding of students regarding the concepts and procedures of problem-solving in mathematics is expected to support and optimize the objectives of learning to be achieved.

Syah, Muhibin (1997:89) stated that the success or failure of achieving educational objectives relies heavily on the student's learning process, both when he was at school or his own home or family environment.

The achievement of mathematics learning objectives can be judged by the student's success in solving mathematics problems. This can be done by carrying out the student learning test. The test can be presented in the form of mathematical problems, both in multiple-choice and description forms. Furthermore, one of the success indicators of mathematics learning can be seen from the students' mathematical test results. If the student test results are good, then it can be said that the material that has been delivered can be received by the students well, and that means that the objective of mathematics learning has been achieved optimally.

Similarly, if the student's test results are lacking, the objective of mathematics learning can be deemed to have not been achieved optimally. The test results are also not just to assess the students, but through the results of the test, we can know where the difficulties faced by the students and also the error that many students do. Furthermore, these errors are analyzed to be determined what appropriate action can reduce the occurrence of the same error.

Based on the interview conducted by the researcher with one of the teachers of mathematics in SMP Negeri 1 Yogyakarta that some students make mistakes in resolving questions related to the system material of two-variable linear equations, Whether it is an error of concept, principle or error procedure. That is because SPLDV is one of the sub material of algebra that is considered quite difficult. Researchers have also interviewed several students about math subjects. Students still consider mathematics to be a painful lesson. That assumption can cause students to struggle to learn mathematics and make it possible for students to have difficulties in solving math problems. Students also find it challenging to memorize the formulas that have been given and the difficulty of applying them in a calculation.

Based on the explanation above, it can be concluded that analyzing the student's mistakes in solving important mathematical problems is one way to find a way out to overcome students' learning difficulties. Therefore, the problem is taken as follows: 1) Is there a mistake done by students of grade VIII SMP Negeri 1 Yogyakarta school year 2016/2017 in solving math problems in SPLDV material? Moreover, 2) What kind of error is most performed by class VIII students SMP Negeri 1 Yogyakarta school year 2016/2017 in solving math problems on SPLDV material? By the problem formulation, the objectives of this research are 1) describe any errors performed by students of Grade VIII SMP Negeri 1 Yogyakarta school year 2016/2017 in solving math problems on SPLDV materials, and 2) Described the most error done by class VIII students SMP Negeri 1 Yogyakarta school year 2016/2017 in solving mathematics problems in SPLDV material.

METHODS

This research is a type of qualitative descriptive research. Researchers use this type of research because the data obtained will be in descriptive analysis. With this type of research, researchers can describe the mistakes that students do through an in-depth and thorough analysis. This study's subject is grade VIII students SMP Negeri 1 Yogyakarta year 2016/2017 and selected a class that amounted to 31 students. This research's object is the fault of students in solving the mathematical problems of the two-variable linear equation of matter in the form of description. The data collection techniques in this study used to test and interview techniques. The instrument in this study, a researcher as the main instrument and instrument of the challenge, is five rounds of test descriptions and interview guidelines.

The data analysis used in this study is the data analysis model of Miles and Huberman. According to Miles and Huberman in Sugiyono (2015:337) suggests that the activity in the qualitative data analysis is done interactively and continues continuously until complete so that the data has been saturated. Activity in data analysis, i.e., data reduction, display data, conclusion drawing/verifying. The Miles and Huberman model analysis steps are described as follows: 1) data Reduction, i.e., reducing data means summarizing, selecting basic things, focusing on important things, searching for themes and

patterns, and removing those that are not Need. Thus the reduced data will provide a clearer picture and make it easier for researchers to do the next data collection and search when needed. The first step in the study is that student's work data is corrected and then grouped or classified according to the types of mistakes performed; 2) Presentation of Data (Display Data), which after the data reduction, from now on performed data presentation. According to Miles and Huberman in Sugiyono (2015:341), the most commonly used to present data in qualitative research is with narrative text. The second step, the data that has been selected or in this case, is the result of the work of students who have passed the reduction process and then analyzed further to determine where the students are doing. Then the results are arranged in the form of description. 3) Withdrawal of conclusion (Conclusion Drawing/verification), after data reduction and presentation of data, i.e., draw conclusions or verification. The final step is to draw conclusions based on the data analysis results already done.

RESULTS AND DISCUSSION

The mistakes students have done in resolving SPLDV matter are grouped into three types:

1. Mistake the concept of student error in determining the mathematical model, error writing examples with variables, errors in writing the set of completion, and wrong question.
2. The principle mistake is an error in using the method of completion, wrong in
3. Operation error is a mistake in calculating algebraic work and other mathematical works.

Data analysis is focused on analyzing the subject of research subjects in solving the SPLDV material test and comparing the interview results to identify the students' location and type of error.

Problem number 1

$$\begin{array}{l} \text{1. } \begin{cases} 2y - x = 10 \\ 3y + 2x = 20 \end{cases} \quad \begin{array}{l} \times 2 \\ \times 1 \end{array} \quad \begin{array}{l} 4y - 2x = 20 \\ 3y + 2x = 20 \end{array} \\ \hline \quad \quad \quad -7y = -40 \\ \quad \quad \quad y = \frac{40}{7} \\ \quad \quad \quad y = 5.71 \end{array}$$

$$\begin{array}{l} \text{2. } \begin{cases} 4y - 2x = 20 \\ 3y + 2x = 20 \end{cases} \quad \begin{array}{l} \times 1 \\ \times 1 \end{array} \quad \begin{array}{l} 4y - 2x = 20 \\ 3y + 2x = 20 \end{array} \\ \hline \quad \quad \quad -y = 0 \\ \quad \quad \quad y = 0 \end{array}$$

Handwritten notes: "Handwritten language", "4p ??", "y = 14", "x = 7".

Figure 1. Answer S19

Excerpts of an interview with S19

P: Just look at question number 1 was told to look for?

S: Find x with y

P: So, what do the numbers between this line mean?

S: That makes you multiplied

Based on the interview passage above shows that students make mistakes because students do not write the set of resolutions, but students only look for x and y grades. Furthermore, writing calculation steps for students is also unclear and incomplete, such as not writing multiplication notation; it shows that the student made an operation error.

Problem number 1 was answered correctly by 13 students (41.94%), and 18 students (58.06%) others answered incorrectly. Students who made a concept error as many as three students (9.68%), because they wrote wrong in the settlement set, eight students (25.81%) made a mistake in principle, seven students were wrong because they did not write the settlement set. One student was wrong in using the settlement method. Furthermore, 16 students (51.61%) made an operation error, where five students made mistakes in writing the completion steps, and 15 students made mistakes in calculating.

Problem number 2

$$\begin{array}{rcl}
 2. & 3x + 2y = -2 & \times 1 \\
 & x - 2y = 10 & \times 3 \\
 \hline
 & 3x - 6y = 30 & \\
 & \underline{3x + 2y = -2} & \\
 & -8y = 32 & \\
 & y = 4 & \\
 & \times 1 & \\
 & 3x + 2y = -2 & \\
 & \underline{x - 2y = 10} & \\
 & 4x = 8 & \\
 & x = 2 & \\
 \hline
 & \text{Jadi himpunan penyelesaiannya } (2, 4) &
 \end{array}$$

Figure 1. Answer S8

Excerpts of an interview with S8

P: Sis, about number 2, do you feel you can work on it? (while showing the results of student work)

S: Can you do it, but it seems like something is wrong counting.

P: Continue to read the problem. What methods are you told to use?

S: Use substitution MBA, but I forget what substitution is? So I used elimination.

P: Furthermore, do you think the writing of the settlement set and the steps are correct?

S: in my opinion, ma'am.

Based on the interview above, students make a calculation error. Students do not understand the method of substitution as instructed in the problem so that students work with the method of elimination, meaning students make a mistaken principle. Students also still do not understand in writing the correct settlement set, and writing the calculation steps is also incomplete.

Problem number 2 was answered correctly by seven students (22.58%), 22 students (70.98%) answered incorrectly, and two students (6.45%) did not answer at all. Twelve students (38.71%) made a concept error, consisting of 2 students wrong questions, ten students wrong in writing a set of resolutions, then 19 students (61.29%) made a principle error, where eight students were wrong for not writing a set of solutions and 14 students were wrong in using the completion method. Furthermore, 18 students (58.06%) made an operation error, where 11 students made mistakes in writing the completion steps, and 16 students made mistakes in calculations.

Problem number 3

$$\begin{array}{rcl}
 3. & 3p - 2q = 12 & \times 1 \\
 & 5p + q = 7 & \times 2 \\
 \hline
 & 3p - 2q = 12 & \\
 & 10p + 2q = 14 & \\
 \hline
 & 13p = 26 & \\
 & p = 2 & \\
 & \times 2 & \\
 & 10p + 2q = 14 & \\
 & \underline{10p + 2q = 14} & \\
 & 0 = 0 & \\
 & y = 2 & \\
 & \text{Jadi himpunan penyelesaiannya } (2, 2) &
 \end{array}$$

Figure 1. Answer S23

Excerpts of an interview with S23

P: Sis, what about question number 3? Try to read the problem?

S: Determine the value of $4p + 3q$ mba.

P: So why aren't you looking for it?

S: Oh yeah, MBA, the problem is that you only look for x values with y .

Based on the interview passage above shows that students make a mistake in principle because it does not determine the value of $4p + 3q$, so students are wrong in concluding.

Problem number 3 was answered correctly by 11 students (35.48%), 13 students (41.94%) made mistakes, and seven students (22.58%) did not answer at all. Twelve students (38.71%) made a mistake in principle, where nine students were wrong in using the method of completion, and five students were wrong because they did not determine the value of $4p + 3q$ according to the command matter. Furthermore, nine students (29.03%) made an operation error, where three students made mistakes in writing the completion steps, and 11 students made mistakes in calculations.

Problem number 4

$$\begin{array}{l} 4g + 3m = 10.500 \\ 3g + 2m = 2.500 \\ \hline 4g + 4m = 21.000 \end{array}$$

Figure 1. Answer S19

Excerpts of an interview with S19

P: Question number 4 asked what?

S: The same mathematical Model is priced at four oranges and six mangoes.

P: What is the mathematical model? Mango.

S: Do you know? Which elimination is what yah?

Based on the above interview passages, students have not understood the concept of mathematical modeling. Students mistakenly distinguish models and methods. The students' answers also do not specify an example.

Problem number 4 is answered precisely by ten students (32.26%), 16 students (51.61%) Make mistakes, and five students (16.13%) Not answered. 16 Students (51.61%) Make the mistake of the concept, where 15 students do not understand the concept of mathematical models and 16 students wrong in determining the Example. Next, ten students (32.26%) Perform an operation error because it is wrong in calculations.

Problem number 5

$$\begin{array}{l} \text{SLK} \\ 3x + \frac{1}{4}y = -4 \quad \times 1 \quad 3x + \frac{1}{4}y = -4 \\ \frac{1}{3}x + \frac{1}{4}y = 2 \quad \times 3 \quad x + \frac{1}{4}y = 6 \\ \hline -\frac{2}{3}x = -10 \\ x = 15 \\ \text{Substitusi ke persamaan } 3x + \frac{1}{4}y = -4 \\ 3(15) + \frac{1}{4}y = -4 \\ 45 + \frac{1}{4}y = -4 \\ \frac{1}{4}y = -49 \\ y = -196 \end{array}$$

Figure 1. Answer S8

Excerpts of an interview with S8

P: Which question do you think is the most challenging number?

S: No. 5 sis, something broke.

P: Oh, yes, but you are almost right, but something is wrong. Try to check where this is wrong?

S: Where the heck are you, sis? I do not know

P: Hmm, now I want to reply $\frac{1}{4}$ times 8. What is the result?

S: The ... Yes two miss

P: Save the reply $\frac{1}{4}$ times two. What about?

S: yes, $\frac{1}{2}$.

P: Well know that, then why yesterday was your brother

Based on the above interview passages, shows that students make an operation mistake in calculating fractions.

Problem number 5 is answered appropriately by two students (6.45%), 18 students (61.29%) Answer with less precise, and 11 students (35.48%) Not answered. Two students (6.45%) Mistake the concept because it is wrong in writing the set of completion. Next, 13 students (41.94%) Make a principle mistake where 12 students are wrong for not writing the set of completion, and one student is wrong in using the method of completion. Next, 18 students (58.06%) Perform an operation mistake,

where three students are wrong in writing the calculation step, and 18 students are wrong in the calculation.

Table 1. Data percentage recapitulation

	Quest No. 1	Quest No. 2	Quest No. 3	Quest No. 4	Quest No. 5
Correct	13 students (41,94 %)	7 students (22,58 %)	11 students (35,48 %)	10 students (32,26 %)	2 students (6,45 %)
Wrong	18 students (58,06%)	22 students (70,98 %)	13 students (41,94 %)	16 students (51,61 %)	18 students (61,29 %)
No answer	-	2 students (6,45 %)	7 students (22,58 %)	5 students (16,13 %)	11 students (35,48 %)
Concept Error	3 students (9,68 %)	12 students (38,71 %)	-	16 students (51,61 %)	2 students (6,45 %)
Mistake of Principle	8 students (25,81 %)	19 students (61,29 %)	12 students (38,71 %)	-	13 students (41,94 %)
Operation Error	16 students (51,61 %)	18 students (58,06 %)	9 students (29,03 %)	10 students (32,26 %)	18 students (58,06 %)

CONCLUSION

Based on the description and results of the analysis of student errors in working on SPLDV material problems that have been explained in the previous chapter, it can be concluded as follows:

- Students make mistakes in completing SPLDV questions. The errors are explained based on the item number of the item. These errors are described as follows:
 - Concept errors are students' mistakes in determining the mathematical model, errors in writing examples with variables, mistakes in writing the set of solutions, and wrong questions.
 - Principal error is a mistake in using the method of settlement, wrong in concluding, such as not writing a set of solutions.
 - Operational errors are errors due to incorrect writing of calculation steps, wrong addition, multiplication, and so on.
- The most frequently made a mistake is an operation error, i.e., the student makes a mistake in writing the calculation steps and the errors in the calculation of both the ordinary calculation and the calculation involving algebraic variables.

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